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Categorization of Breast Fine Needle Aspirates Using Yokohama Classification and Its Correlation With Histopathological Findings

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ABSTRACT

Objective: Breast cancer is the most prevalent cancer among women worldwide. In developing countries, fine needle aspiration cytology (FNAC) is commonly used for screening to reduce mortality rates. The International Academy of Cytology has established the Yokohama system to enhance diagnostic clarity and communication between pathologists and clinicians. A triple test approach, incorporating clinical evaluation, imaging, and FNAC, can further improve patient care for breast lesions and may enhance the Yokohama System's effectiveness.

Materials and Methods: A prospective study about breast FNAC was done over a period of one year, from October 2022 to September 2023. The study involved patients with breast lesion referred for FNAC in the department of Pathology. The FNAC results were further classified using the Yokohama system for reporting breast cytopathology, 2016. The cytological findings were correlated with available histopathological results.

Results: In the study of 104 cases, 60 (57.7%) of whom had available histopathology results, breast lesions were categorized using the Yokohama system as: 7.7% insufficient, 47.1% benign, 26.9% atypical, 2.9% suspicious of malignancy, and 15.4% malignant. The risk of malignancy varied by category: 0% for category 1, 3.2% for category 2, 47% for category 3, and 100% for categories 4 and 5. The maximum sensitivity was 94.7% when considering atypical, suspicious, and malignant cases as positive. The highest specificity was 97.56% for malignant cases alone, while the best diagnostic accuracy was 83.3% when both malignant and suspicious cases were counted as positive.

Conclusion: The Yokohama system effectively classified borderline lesions, facilitating early detection and improved management options. By integrating FNAC with standardized reporting, healthcare providers can make informed decisions, enhancing the diagnosis and treatment of breast lesions.

Keywords: Breast cancer; fine needle aspiration cytology; Yokohama system; risk of malignancy

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Key Points

- Breast cancer is the leading cancer among women worldwide.
- Fine needle aspiration cytology (FNAC) is preferred for breast lesions, particularly in experienced hands, and its turnaround time can be further reduced with rapid onsite evaluation.
- The newly proposed International Academy of Cytology Yokohama System for Reporting Breast Cytopathology presents a straightforward approach that enhances diagnostic precision, thereby facilitating improved communication between pathologists and treating clinicians.
- This study underscores the importance of using a standardized reporting systems for FNAC to improve diagnostic accuracy and patient care in breast lesions.

Introduction

Breast cancer is the most prevalent cancer among women worldwide and ranks second in overall cancer incidence after lung cancer. In 2022, there were an estimated 2.29 million new breast cancer cases, accounting for 11.5% of all cancer diagnoses. It is also the fourth leading cause of cancer-related deaths, with 666,103 fatalities (1).

In India, breast cancer is the most common cancer overall and among women, with 192,020 new cases reported in 2022, representing 13.6% of all new cancer cases. The total number of deaths due to breast cancer was 98,337, resulting in a mortality rate of 10.7%. Among females, breast cancer accounts for 26.6% of all new cancer cases (2).

All breast lesions are not malignant, and all the initially benign lesions do not progress to cancer; however, the accuracy of diagnosis can be

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increased by a combination of preoperative tests, such as physical examination, mammography, fine needle aspiration cytology (FNAC), and core needle biopsy (CNB) (3).

To enhance outcomes and survival rates for breast cancer, early detection is essential. The aim is to raise the percentage of breast cancers identified at an early stage, which facilitates more effective treatment and lowers the risk of mortality. Strategies for early detection involve screening and prompt diagnosis (4).

In the developing world, FNAC remains one of the most frequently performed procedures and is increasingly integrated into screening initiatives aimed at lowering breast cancer mortality rates. FNAC is commonly employed to evaluate breast lesions. This outpatient procedure involves extracting a small sample of breast tissue or fluid from a suspicious area to check for cancer cells. FNAC is a cost-effective method that can help avoid unnecessary surgeries (5).

FNAC is very effective at distinguishing between benign and malignant lesions. Both FNAC and CNB provide comparable pathological information, but FNAC has the added benefits of being more affordable, quicker, and offering rapid reassurance (6). FNAC is valued for its simplicity, cost-effectiveness, and quick results. However, CNB has become popular for its ability to assess histological grade and hormonal status. When FNAC is combined with clinical and radiological data, its sensitivity and specificity match those of CNB. At our tertiary facility, FNAC is particularly important due to the time and cost constraints associated with CNB. It is the preferred method for evaluating breast lesions, especially when conducted by skilled professionals, and its processing time can be shortened with rapid onsite evaluation. We primarily use FNAC and reserve CNB for cases with atypical or suspicious characteristics. Implementing standardized reporting systems improves consistency across institutions, enhances communication between clinicians and pathologists, and ultimately benefits patient care (7).

Recently the International Academy of Cytology (IAC) proposed a new reporting system for breast FNAC named the Yokohama System. It defines five categories for reporting breast cytology, each with a clear descriptive term for the category, a definition, a risk of malignancy (ROM) and a suggested management algorithm (8). The Yokohama System classifies cytologic diagnoses into five categories: (1) insufficient material, (2) benign, (3) atypical, (4) suspicious for malignancy, and (5) malignant. This system highlights the importance of FNAC smears and the expertise of well-trained cytopathologists for effective diagnostic breast FNA cytology. Current practices in breast FNAC have advanced with the greater use of ultrasound guidance and rapid onsite evaluation. Triple test of clinical, imaging and FNAC assessment will lead to improvements in the care of patients with breast lesions and possible modifications to the IAC Yokohama System (8).

In this study, we used the newly proposed IAC Yokohama classification system to analyse breast FNAC cases from our Pathology Department. We assessed the ROM for each category and evaluated the diagnostic effectiveness of this technique.

Materials and Methods

This cross-sectional study was conducted in Department of Pathology, Bhagat Phool Singh Government Medical College for Women, Khanpur Kalan, Sonepat over one year from September 2022 to September 2023. The study was conducted with 104 cases with breast lesions. Patients with breast lesions presenting to the Surgery OPD at BPS GMC for Women, were selected and referred to the Pathology Department for FNAC. Cases were categorized based on the IAC Yokohama classification into different diagnostic groups. Imaging findings, classified according to the breast imaging-reporting and data system, were also correlated with FNAC results to enhance diagnostic accuracy. The FNAC results were correlated with the clinical and imaging findings of the lesion. If the lesion was benign on imaging findings, no further investigation was done. If suspicious on imaging/clinical, then CNB was performed. In atypical, Suspicious and malignant cases, CNB/excision biopsy was done. The FNAC findings were compared with histopathological results to assess the diagnostic accuracy, sensitivity, specificity, and predictive values of Yokohama System of FNAC in the evaluation of breast lumps. Out of the included cases that underwent FNAC, 60 (57%) proceeded to histopathological evaluation at our institute.

Consecutive sampling technique was used for collection of the study sample.

Ethical approval for the study was granted by the Institutional Ethics committee of Bhagat Phool Singh Government Medical College for Women, Khanpur Kalan vide IEC registration number: BPSGMCW/RC/799/IEC/2022, dated 11/10/2022. Study participants had the purpose of the study explained to them and were also informed of absolute confidentiality and privacy of the data. The information sheet was read out to the study subjects in a language they could understand, and all the questions and queries raised by them were answered to their satisfaction. It was stressed that participation in the study was purely voluntary, and they were free to withdraw from the study at any point of time and there would be no administrative consequences for their withdrawal from the study. A well-informed written consent was taken from all participants.

Inclusion Criterion

All the patients having breast lesion who was referred for FNAC in department of Pathology.

Exclusion Criteria

1. Patients with ulcerative lesion or skin involvement.

2. Patients with history of chemotherapy and/or radiotherapy.

Statistical Analysis

Statistical analysis was executed using SPSS, ver. 20 (IBM INc., Armonk, NY, USA) Data was collected and stored on a Microsoft Excel Spreadsheet. The ROM was defined for each category as the number of confirmed malignant cases/total number of cases in the diagnostic category. Sensitivity, specificity, positive predictive value (PPV), and negative predictive value (NPV), and accuracy ratios were calculated using the histologic diagnosis as the gold standard. The ratios were determined based on three categories. In category A only malignant cases were regarded as a positive test result. Both suspicious and malignant cases were included as positive tests in category B, and in category C atypical, suspicious, and malignant cases were all included. Chi-square test and other appropriate test were used to investigate association between categorical variables. A $p<0.05$ was considered statistically significant.

Results

A total of 104 cases were included, with the highest number of cases in the age group 21–30 years (31.7%), followed by 41–50 years (23.07%). The age of presentation ranged from 14 to 82 years in study with a mean age of 36.78±14.65 years. Breast lesions were more common in the left breast (54.8%) compared to the right (45.2%). The breast lesions were more common in females with female to male ratio of 52:1. The majority of breast lesions diagnosed on cytology were benign proliferative lesions (26%) followed by atypical proliferative breast lesions (21%). Sixteen lesions were categorised under category 5 suggestive of carcinoma of the breast (Table 1).

Diagnostic categorization of breast lesions using the Yokohama system resulted in the following:

1. Insufficient – 7.7%

2. Benign – 47.1%

3. Atypical – 26.9%

4. Suspicious of malignancy – 2.9%

5. Malignant – 15.4%

To enhance the understanding of the morphological features associated with each category of the Yokohama System of Reporting Breast Fine Needle Aspirates, representative images from actual cases are included. These images illustrate key cytological findings across the five diagnostic categories (Figure 1).

The histomorphological features of a few selected cases are depicted in the images below, highlighting the typical microscopic appearances of various benign and malignant breast lesions observed in the study (Figure 2).

The highest number of lesions were categorized under category 2 (benign) followed by category 3 (atypical) and category 5 (malignant) respectively. Histopathological diagnosis available in the 60 breast cases showed fibroadenoma (20%) and benign phyllodes (16.7%) as the most common diagnoses in the benign category and invasive ductal carcinoma (20%) as the most common diagnosis in the malignant category. Out of these 60 cases, the largest number were invasive ductal carcinoma n = 13 (21.7%) followed by fibroadenoma n = 12 (20%), and then n = 10 cases of benign phyllodes (16.7%). Four lesions were diagnosed as granulomatous and three cases each of borderline phyllodes and metaplastic carcinoma (Table 2). Table 3 shows histopathological spectrum of breast lesions and its correlation with the Yokohama system. Most cases were categorized under category 2 with 31 cases (51.7%) followed by category 3 with 17 cases (28.3%).

Sensitivity, specificity, PPV, NPV and accuracy of the Yokohama classification when only malignant lesions were considered positive were 47.37%, 97.56%, 90%, 80% and 81.67% respectively. When malignant and suspicious of malignancy lesions were combined and considered positive these same values were 52.63%, 97.56%, 90.91%, 81.63% and 83.33% respectively. Finally, when the categories malignant, suspicious of malignancy and atypical were combined and considered positive the sensitivity, specificity, PPV, NPV and accuracy were 94.74%, 75.61%, 64.29%, 96.87% and 81.67% respectively. The ROM for various categories in the present study was 0% for category 1, 3.2% for category 2, 47% for category 3, 100% for category 4, and 100% for category 5 (Table 4).

Table 1. Cytological diagnosis of breast lesions (n = 104)

Yokohama category	No. of cases	Cytological diagnosis
I (Insufficient)	8	
II (Benign)	49	Proliferative benign mammary lesion (27) Benign mammary lesion with cystic change (9) Granulomatous inflammation (2) Proliferative mammary lesion with lactational changes (1) Subareolar abscess (1) Inflammatory lesion (4) Duct ectasia (2) Fibrolipoma (1) Necrotic change (1) Lipomatous lesion (1)
III (Atypical)	28	Proliferative breast lesion with atypia (22) Fibroadenoma With epithelial hyperplasia (3) Atypical ductal hyperplasia (2) Papillary lesion (1)
IV (Suspicious of malignancy)	3	Suspicious of carcinoma (3)
V (Malignant)	16	Carcinoma breast (16)
Total cases	**104**	

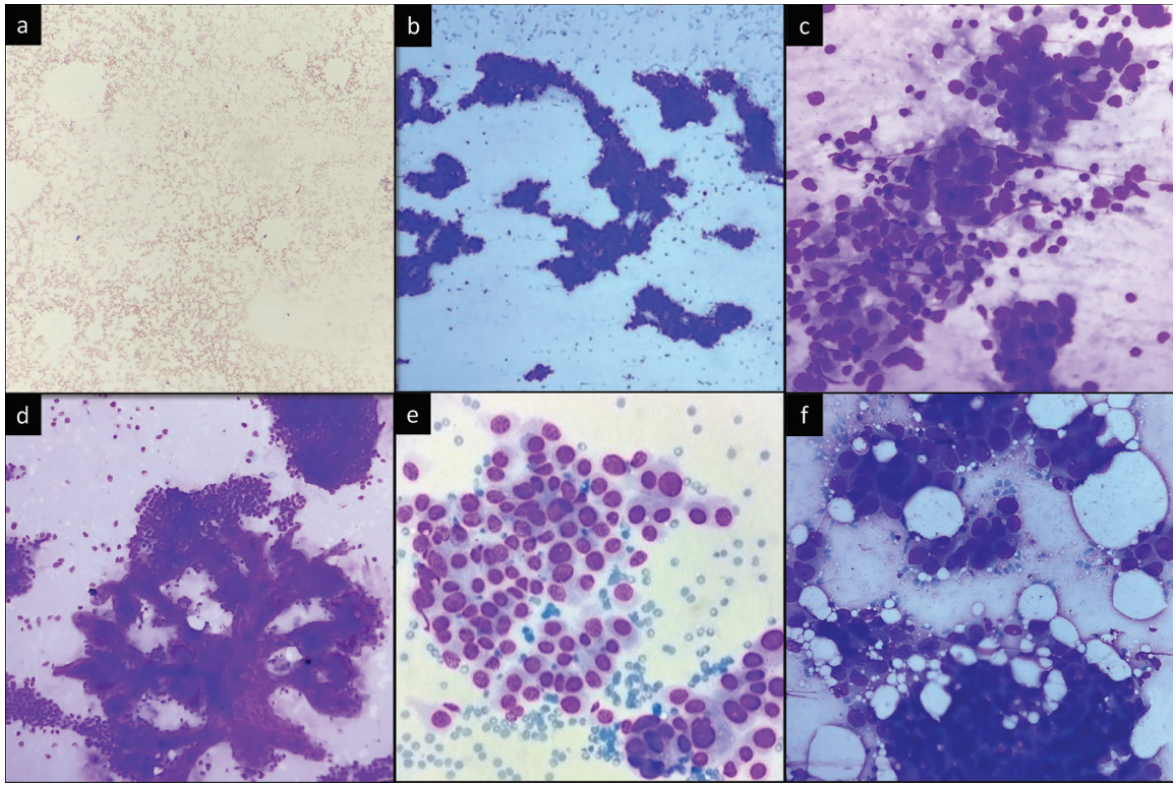

Figure 1. (a) Category I, Insufficient (MGG 40X), **(b)** Category II, Benign: Antler horn architecture in the background of numerous bare nuclei. (MGG 100X), **(c)** Category III, Atypial: Benign cluster with slight nuclear enlargement and pleomorphism (MGG 400X), **(d)** Category IV, Suspicious of Malignancy: Papillary architecture with mild nuclear pleomorphism and inconspicuous nucleoli. (MGG 100X), **(e,f)** Category V, Malignant: **(e)** Loose cohesive cluster of intermediate-sized cells with a high N:C ratio, moderately enlarged and pleomorphic nuclei with small nucleoli (MGG 100X), **(f)** Fat infilteration by neoplastic cells (MGG 100X)

Table 2. Histopathological diagnosis of breast lesions (*n* = 60)

Category	Histological diagnosis	No. of cases
Benign (41)	Fibroadenoma/fibroadenoma with epithelial hyperplasia	**12**
	Benign phyllodes tumor	**10**
	Granulomatous mastitis	**4**
	Borderline phyllodes tumor	**3**
	Duct ectasia	2
	Fat necrosis	2
	Fibroadenosis	1
	Complex fibroadenoma	1
	Lipoma	1
	Adenomyoepithiloma	1
	Pleomorphic adenoma of breast	1
	Lactational adenoma	1
	Intraductal papillomatosis	1
	Gynaecomastia	1
Malignant (19)	Infiltrating/invasive ductal carcinoma	13
	Metaplastic carcinoma	3
	Non-Hodgkin lymphoma	1
	Lobular carcinoma	1
	Invasive ductal carcinoma with medullary features	1
Total		60

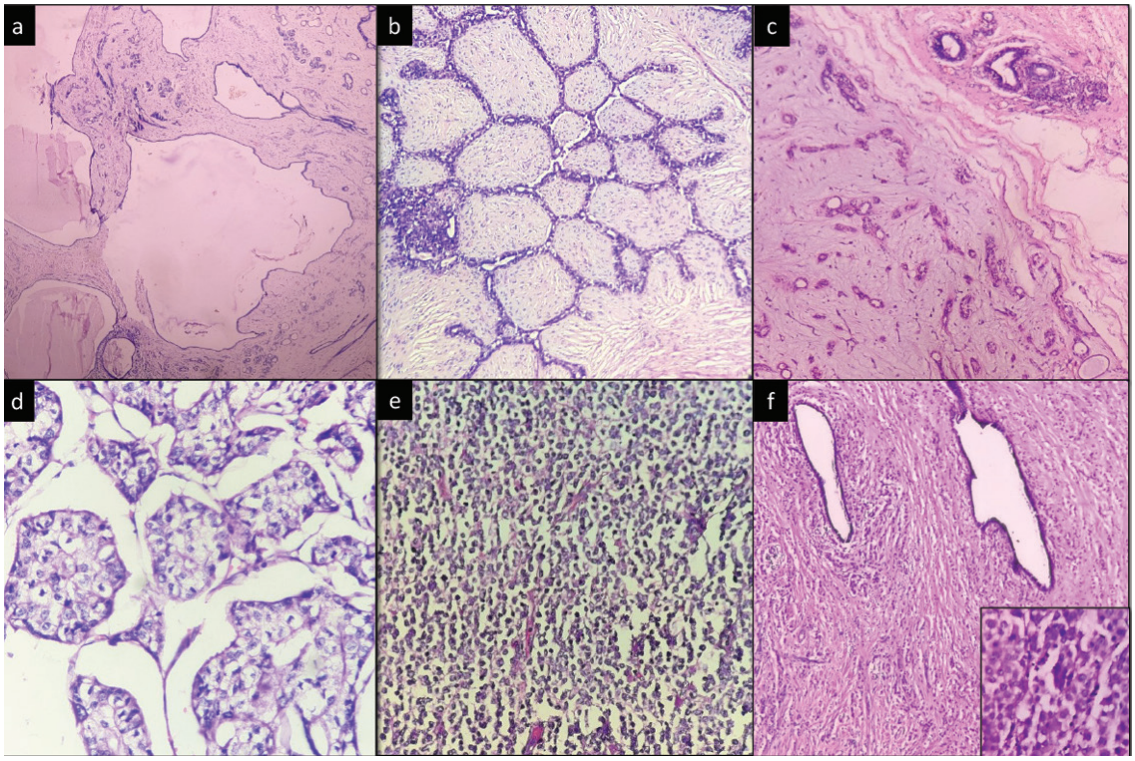

Figure 2. (a) Complex Fibroadenoma: Fibroadenoma showing multiple cystic changes (H&E, 100X). **(b)** Benign Phyllodes: leaf-like epithelial pattern with exaggerated intracanalicular pattern suggestive. (H&E, 100X). **(c)** Pleomorphic adenoma: well circumscribed lesion with characteristic epithelial and myoepithelial elements without atypia, embedded into a chondromyxoid stroma. (H&E, 100X). **(d)** Invasive ductal carcinoma: infiltrative back to back nests of tumour cells with moderately enlarged nuclei. (H&E, 100X). **(e)** Non Hodgkin Lymphoma: tumour cells arranged in sheets, small clusters and groups. The cells were large with irregular nuclear contour, vesicular chromatin and prominent nucleoli. (H&E, 100X). **(f)** Lobular Carcinoma: Section shows strands of tumour cell having abundant eosinophilic cytoplasm with slight pleomorphic nuclei. (H&E, 100X,400X)

H&E: Hematoxylin-eosin

Discussion and Conclusion

The study highlighted the potential of the Yokohama system to classify borderline lesions more accurately, aiding in early detection and management decisions. The atypical category included fibroadenomas, fibroadenomas with epithelial hyperplasia, or low-grade phyllodes, challenging to differentiate on cytomorphology. Misdiagnosis of malignant lesions as benign/atypical was the result of scant cellularity and deep-seated lesions. Discordant findings in the "triple test" parameters warrant further evaluation, such as an additional CNB. Indeterminate categories in the Yokohama system (atypical and suspicious) allow classification of borderline lesions with a greater ROM.

Overall, our study underscores the importance of FNAC with utilizing standardized reporting systems to improve diagnostic accuracy and patient care in breast lesions.

FNAC is valued for its simplicity, practicality, cost-effectiveness, and quick results, but CNB has become popular due to its ability to assess histological grade and hormonal status. However, when FNAC is combined with clinical and radiological findings, its sensitivity and specificity is increased (9). At our tertiary centre, FNAC plays a crucial role, especially considering limitations in time and cost for CNBs. FNAC is preferred for breast lesions, particularly in experienced hands, and its turnaround time can be further reduced with rapid onsite evaluation. We use FNAC primarily, resorting to CNB only for atypical or suspicious cases. Standardized reporting systems improve report consistency across institutions, enhancing communication between clinicians and pathologists and ultimately benefiting patient care.

The Yokohama system proposed by the IAC classifies FNAC results into five categories, aiding diagnosis and management.

The mean age of the patient was almost 37 years and the age ranged from 14 to 82 years. The findings are similar to a previous study by Sundar et al. (10) where mean age was 41.3 years and ranged from 14 to 83 years.

The greatest number of cases were categorized as Yokohama 2 (benign) followed by Yokohama 3 (atypical) fand thirdly Yokohama 5 (malignant). This distribution of Yokohama reporting system categories in the present study was similar to the results obtained by Apuroopa et al. (11) and Montezuma et al. (12) However, studies by De Rosa et al. (13), McHugh et al. (14), Wong et al. (15), Agrawal et al. (6), Kamatar et al. (16), and Ahuja and Malviya (9), reported the highest proportion of cases falling into category 2 (benign) followed by category 5 (malignant) followed by category 3 (atypical).

The ROM for various categories in the present study was 0% for category 1, 3.2% for category 2, 47% for category 3, 100% for category 4, and 100% for category 5. These results are similar to those reported by Kamatar et al. (16), Montezuma et al. (12) and Apuroopa

Table 3. Histopathological spectrum of breast lesions and its correlation with Yokohama categories (*n* = 60)

Histopathology diagnosis	Yokohama category					Total
	I	II	III	IV	V	
Benign phyllodes tumor	-	5	5	-	-	10
Fibroadenoma	-	8	1	-	-	9
Granulomatous mastitis	-	3	1	-	-	4
Fibroadenoma with epithelial hyperplasia	-	2	1	-	-	3
Borderline phyllodes tumor	-	2	1	-	-	3
Duct ectasia	-	2	-	-	-	2
Fat necrosis	-	2	-	-	-	2
Fibroadenosis	-	1	-	-	-	1
Complex fibroadenoma	-	1	-	-	-	1
Lipoma	1	-	-	-	-	1
Adenomyoepithiloma	-	1	-	-	-	1
Pleomorphic adenoma of breast	-	1	-	-	-	1
Lactational adenoma	-	-	1	-	-	1
Intraductal papillomatosis	-	1	-	-	-	1
Gynaecomastia	-	1	-	-	-	1
Infiltrating/invasive ductal carcinoma	-	1	5	1	6	13
Lobular carcinoma	-	-	-	-	1	1
Non-Hodgkin lymphoma	-	-	-	-	1	1
Metaplastic carcinoma	-	-	2	-	1	3
Invasive ductal carcinoma with medullary features	-	-	-	-	1	1
Total	**1**	**31**	**17**	**1**	**10**	**60**

Table 4. Distribution of IAC Yokohama system categories with cyto-histological correlation and risk of malignancy

	Insufficient	Benign	Atypical	Suspicious of malignancy	Malignant
Histological benign	1 (Lipoma)	30 (FA-8, benign PT-5, granulomatous mastitis-3, FA with epithelial hyperplasia-2, borderline PT-2, duct ectasia-2, fat necrosis-2, fibroadenosis-1, complex FA-1, adenomyoepithiloma-1, pleomorphic adenoma of breast-1, intraductal papillomatosis-1, gynaecomastia-1)	10 (FA-1, FA with epithelial hyperplasia-1, benign PT-5, borderline PT-1, granulomatous mastitis-1, lactational adenoma-1)	0	0
Histological malignant	0	1 (IDC)	7 (IDC-5, metaplastic carcinoma-2)	1 (IDC)	10 (IDC-6, IDC with medullary features-1, lobular carcinoma-1, NHL-1, metaplastic carcinoma-1)
Risk of malignancy %	**0**	**3.2**	**41.1**	**100**	**100**

FA: Fibroadenoma; PT: Phyllodes tumour; IDC: Invasive ductal carcinoma

Table 5. Sensitivity, specificity, PPV, NPV, accuracy of IAC Yokohama system

	Group A (category malignant considered positive)	Group B (category malignant and suspicious considered positive)	Group C (category malignant, suspicious and atypical considered positive)
Sensitivity	47.37%	52.63%	94.74%
Specificity	97.56%	97.56%	75.61%
PPV	90.0%	90.91%	64.29%
NPV	80.0%	81.63%	96.87%
Accuracy	81.67%	83.33%	81.67%

PPV: Positive predictive value; NPV: Negative predictive value. Table 5 shows sensitivity, specificity, PPV, NPV and accuracy of Yokohama classification when only category malignant considered as positive; when category malignant and suspicious of malignancy considered as positive and when category malignant, suspicious of malignancy and atypical considered as positive

Table 6. Comparison of diagnostic accuracy of breast FNAC in diagnosis of malignancy using Yokohama system in various studies (*n* = 60)

Category included		De Rosa et al. (13)	Wong et al. (15)	Montezuma et al. (12)	Agrawal et al. (6)	Ahuja and Malviya (9)	McHugh et al. (14)	Present study
	No. of cases	**1616**	**536**	**755**	**299**	**224**	**199**	**104**
(Group A) only malignant category taken as positive	**Sensitivity**	82.2	75.4	68.7	86.7	79.2	65.4	**47.37**
	Specificity	97.8	100	100	100	100	95.9	**97.56**
	PPV	98.8	100	100	100	100	91.9	**90.0**
	NPV	71.0	80.7	87.7	71.2	90.9	81.1	**80.0**
	Accuracy	87.0	87.9	90.3	90.0	93.2	83.9	**81.67**
(Group B) suspicious of malignancy and malignant taken as positive	**Sensitivity**	93.7	92.0	83.3	96.0	91.7	79.5	**52.63**
	Specificity	90.8	97.8	99.8	91.9	98.7	85.1	**97.56**
	PPV	95.8	97.6	99.5	97.3	97.1	77.5	**90.91**
	NPV	86.6	92.7	93.0	88.3	96.1	86.6	**81.63**
	Accuracy	92.8	95.0	94.7	95.0	96.4	82.9	**83.33**
(Group C) atypical, suspicious of malignancy and malignant taken as positive	**Sensitivity**	98.9	98.9	98.3	98.2	97.2	84.6	**94.74**
	Specificity	46.3	62.1	54.8	59.5	86.0	75.2	**75.61**
	PPV	80.5	71.7	49.2	88.0	77.0	68.8	**64.29**
	NPV	95.1	98.3	98.6	91.7	98.5	88..3	**96.87**
	Accuracy	82.7	80.2	68.2	88.6	89.6	78.9	**81.67**

The highest specificity (97.56%) was seen when only malignant cases (Group A) and malignant and suspicious (Group B) were included in positive test results, whereas maximum diagnostic accuracy (83.3%) was observed when malignant and suspicious (Group B) cases were included in positive results. Ahuja and Malviya (9), Wong et al. (15), Montezuma et al. (12), Agrawal et al. (6), and De Rosa et al. (13) demonstrated similar findings. McHugh et al. (14) observed highest sensitivity and specificity in similar scenarios, but they observed maximum accuracy when only malignant cases were considered as positive test results. FNAC: Fine needle aspiration cytology; PPV: Positive predictive value; NPV: Negative predictive value

et al. (11) McHugh et al. (14) also observed similar findings but they observed 46% ROM in suspicious of malignancy category.

In the current study, the maximum sensitivity (94.7%) was achieved when atypical, suspicious, and malignant cases (group C) were considered positive test results. However, the inclusion of atypical cases in positive results resulted in markedly decreased specificity and accuracy. The highest specificity (97.56%) was seen when only malignant cases (group A) and malignant and suspicious (group B) were included in positive test results, whereas maximum diagnostic accuracy (83.3%) was observed when malignant and suspicious (group B) cases were included in positive results (Table 5). Ahuja and Malviya (9), Wong et al. (15), Montezuma et al. (12), Agrawal et al. (6), and De Rosa et al. (13) demonstrated similar findings. McHugh et al. (14) observed highest sensitivity and specificity in similar scenarios, but they observed maximum accuracy when only malignant cases were considered as positive test results (Table 6).

The majority of breast lesions identified through cytology were categorized as proliferative mammary lesions, followed by proliferative breast lesions with atypia, and then carcinoma. Within the atypical category, breast lesions included fibroadenoma with epithelial hyperplasia, benign phyllodes, atypical ductal hyperplasia, metaplastic carcinoma, and invasive ductal carcinoma upon histological examination. Distinguishing between these lesions based solely on cytomorphology proved challenging. Misclassification of malignant lesions as atypical occurred due to low cellularity and a lesser degree of atypia. In addition, a few cases of invasive ductal carcinoma were incorrectly labelled as atypical, due to being deep-seated lesions resulting in hypocellular smears with only a small number of atypical cells exhibiting significant nuclear enlargement. One malignant lesion, which was reported as benign were possibly due to sampling error. Thus, whenever two out of three "triple test" parameters show discordant findings, we suggest followed up with a CNB. The two indeterminate categories in the Yokohama system - atypical and suspicious allow for the classification of borderline lesions like atypical ductal hyperplasia, which carry a greater risk of developing malignancy than benign lesions.

The experience of the cytopathologist plays a crucial role in diagnostic accuracy, ROM estimation and interobserver agreement. Experienced cytopathologists are better at distinguishing between benign, atypical, suspicious, and malignant categories based on cellular morphology. They are less likely to misinterpret borderline lesions, reducing the risk of false positives and false negatives. More experienced cytopathologists may provide more accurate ROM estimations for each category, aligning better with histopathological outcomes. Interobserver agreement improves with experience, particularly in distinguishing category 3 (atypical) from category 4 (suspicious).

In accordance with previous classification methods, such as the Bethesda System for Reporting Thyroid Cytopathology, the newly proposed IAC Yokohama System for Reporting Breast Cytopathology presents a straightforward approach that enhances diagnostic precision, thereby facilitating improved communication between pathologists and treating clinicians. It offers a standardized platform for reporting and enhancing reproducibility of reports, similar to the Milan systems used for salivary gland lesions and Bethesda system for thyroid cytopathology. Breast ultrasound, being a non-invasive imaging technique, can synergize with these diagnostic tools to aid in patient diagnosis and treatment planning. Furthermore, recent advances in both ultrasound and cytopathology techniques, such as immunocytochemistry, imaging-guided FNAC, and Doppler in sonomammography, have the potential to enhance their accuracy further.

Ethics

Ethics Committee Approval: Ethical approval for the study was granted by the Institutional Ethics committee of Bhagat Phool Singh Government Medical College for Women, Khanpur Kalan vide IEC registration number: BPSGMCW/RC/799/IEC/2022, dated 11/10/2022.

Informed Consent: A well-informed written consent was taken from all participants.

Footnotes

Authorship Contributions

Concept: V.R., P.K., M.G.; Design: V.R., P.K., M.G., P.M., C.G., S.H.; Data Collection or Processing: V.R.; Analysis or Interpretation: V.R., P.K., M.G.; Literature Search: V.R.; Writing: V.R., P.K., M.G., P.M., C.G., S.H.

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